

AN OLD MANGROVE MUD-FLAT EXPOSED BY WAVE SCOURING
AT GLENELG, SOUTH AUSTRALIA

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On 17 June 1949 Mr. H. M. Cooper drew my attention to an old mangrove mud-flat recently exposed by wave scouring. The site is situated between Broadway and Weewanda Street, Glenelg, and extends for a distance of about a quarter of a mile. At low tide the mangrove flat is exposed from almost the water's edge for a distance of some twenty yards up the beach, and then follows an old quartzite pebble beach some three yards in average width, and then fine sand of the present beach.

Dead trunks, roots and pneumatophores of the mangrove, *Avicennia officinalis* are to be seen in numbers planed off level with the mud surface by gentle tidal action, leaving sections exposed. Numerous dead shells are embedded in the mud in their living position. They are species similar to those found at the Port River mangrove flats today. The bivalves are *Macoma deltooidalis*, *Macoma modestina*, *Venerupis crebriclamellata*, *Venerupis crenata*, *Soletellina biradiata*, *Eumarcia fumigata*, *Notospisula parva*, *Pholas australasiae* and *Nototeredo edax*. Gastropods are *Bembicium imbricatum*, *Zacumantus diemenensis*, *Austrocochlea zebra*, *Salinator fragilis*, *Uber conicum*, *Phasianella australis*. In addition to these there are reef shells such as *Cleidothermus albidus*, *Ostrea sinuata*, *Brachyodontes erosus*, *Cominella eburnea*, *Trichomya hirsuta* and *Melanerita melanotrachus*. The reef shells apparently attached to or lived upon the hard sandstone capping, two or three inches thick, found in patches on top of the black mud. Odd samples of the sandstone are covered with young dead "Port Lincoln" oysters of the species mentioned above. Dead specimens of the "shipworm" *Nototeredo edax* are found in practically every mangrove stump examined.

Certain species of mollusca found *in situ* are larger than present-day living specimens. *Bembicium imbricatum* averages over twice the bulk of living examples. *Austrocochlea zebra* is taller and the mussel *Brachyodontes* is consistently slightly larger. Mangrove flats throughout Australia have a similar fauna and show little alteration in different faunal regions, except that produced by lower temperatures. The result is that the large species of the North are missing in the South, and even the species common to all mangrove areas become smaller in cooler waters. Therefore it is logical to expect that the mangrove mud-flat here exposed enjoyed a slightly warmer climate in its day. Mangroves are gradually retreating north in Gulf St. Vincent. Whereas there is every indication from faunal studies that the mangrove lived until a comparatively short time ago on both sides of the present beach sand dune as far south as Port Noarlunga, it has now retreated north to the region of the Outer Harbour mud-flats. Here within the last twenty years silting has killed them over most of the large area which is shortly to be reclaimed for harbour works.

The recently exposed site was rapidly desiccated by tidal action. It was first examined on 17 June. On 19 June it was partly covered by weed (*Posidonia*). By 24 June the pebble reef was mostly covered with sand over its full length, and the sand has already thinly covered a large portion of the mangrove flat.

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By August 15th the scoured area was almost entirely covered with a smooth layer of fine sand like that so typical of Adelaide beaches.

It was ascertained by digging on 3 February 1950 that a minimum average of twenty inches of sand covered this site.

The shells could not remain *in situ* very long when exposed for a week after 17 June. They were already being washed out of the soft black mud. A fisherman, Mr. F. Page, says that a small portion of mangrove flat, about 50 yards long and 20 yards wide, was exposed in front of Wcewanda Street in January 1949.

Behind the present sand-dunes, in the area known as New Glenelg, fresh water is struck at about 12 feet in a quartzite pebble bed, which is situated at about the same level as the quartzite bed of the beach. This pebble bed evidently continues almost to the foot of the old red sandhills, which stretch from Somerton to Glenelg in an almost uninterrupted sequence and are exposed near Brighton Road, Sacred Heart College, and at the corner of the College playing fields near Walker's Road. The western edge of the red sand-dunes runs north and south and a little west of Moseley Street. They were merely low ridges about 15 feet in maximum height, but buildings, roads and other influences have now obliterated traces in most areas. In June 1948 scouring took place at Brighton, and the surface sand was removed to a depth of four feet, exposing in places the top of the black mud. The vertebrae and ribs of a whale skeleton were revealed *in situ*. The discovery was reported by Mrs. E. M. Nairn of Brighton. The Director of the South Australian Museum, Mr. H. M. Hale, identified the skeleton, which is in a poor state of preservation, as a whale-bone whale, probably a hump-back. It is possible that the skeleton is contemporary with the mangrove flat. It is suggested that the mangrove flat and quartzite reef may be contemporary with the old red sandhills. It is difficult to decide whether the pebbles are of coastal origin or indicate an old opening of the Sturt River. The occurrence of cross-bedded red sandstone typical of the Adelaide system favours an origin consistent with sea-shore transportation as rocks of this group outcrop in the sea-cliff regions from Marino South. Such rocks do not outcrop in the valley of the River Sturt.

It is interesting to note that a sketch of this area by Colonel Light in about 1836 depicts the beach pretty well as at present, the coastal dunes probably bound with true spinifex (*Spinifex hirsutus*), *Olearia* and other dune vegetation, as they are today. The dunes are 250 yards wide and up to 30 to 50 feet in height, sloping to high water level towards sea. Streets and buildings now cover portion of the inner edge of what is really an unbroken dune ridge.

A test bore shows mangrove mud to be about two feet in thickness followed by glauconitic clay, then sand, but no rock. This suggests that the mangroves flourished for only a comparatively short period.

It may be that the unusual scouring of the beach in this area first commenced when the artificial projection of the Broadway sea-wall was built in 1928. The bottom of this sea-wall is just below high-tide mark. The scouring was strongly accentuated during a heavy sea in April 1948 when H.M.A.S. "Barcoo," survey frigate, was driven ashore at Glenelg North. From then on the scouring continued for about twelve months, exposing the first small portion of mangrove flat in January 1949, mentioned by F. Page.

Mr. A. G. Edquist kindly directed my attention to the sequence of strata exposed in a recently excavated drainage well. Situated on a property in Farrell Street at about 200 yards from high tide mark, the excavation has reached a depth of six feet. The uppermost layer is of black swamp silt which may have been

originally dune sand and vegetation, and is about twelve inches in thickness. Next follows a limestone band, six inches thick, apparently contemporary with that of the oyster bed in the mangrove flat.

Beneath this is two feet of yellow sand. Under the sand is about six inches of light coloured mud and sand in which is an abundance of *Coxiella* shells similar to those found in such quantity in the Coorong and around inland salt lakes.

Beneath is the black mud of the mangrove swamp with the cockle *Katylsia* and other marine shells of the mangrove suite.

This sequence, situated in the swale behind the present beach-dunes, presents an interesting contrast to the wave-scoured site on the beach front.

Some years ago a fresh water swamp existed here which accounts for the black swamp-silt resting above the limestone. The fine yellow sand beneath the limestone may be beach dune-sand. The *Coxiella* mud suggests a salt-lake with changing salinity as these molluscs flourish in changing salt concentrations, from water saltier than the sea to almost fresh. Beneath this is the mangrove mud-flat.

On 9 February 1950 a similar though smaller site at Henley Beach, just north of the River Torrens outlet, was brought to my notice by Mr. C. V. Fischer. He states that the scouring was first observed about April 1948, with which date the heavy scouring at Glenelg corresponds.

H. M. Cooper intends to describe later some of the native stone implements and other material discovered by him on the site.

CONCLUSION

The mangrove mud-flat recently exposed by wave-scouring flourished for a short period from, say, one thousand to three thousand years ago when the climate was a little warmer, and may have been contemporary with the old red sand-hills. The mangroves were comparatively quickly exterminated by sand-silting. This process is now proceeding at the Outer Harbour, and has previously killed the mangroves which once grew as far south as Port Noarlunga.